



AUGMENT APPLICATIONS AND FEATURES

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This document discusses only the software aspects of AUGMENT and is intended to give the reader an appreciation for the depth and scope of AUGMENT applications and features. We recognize that it may be too detailed for some and that others may find detail lacking. If you wish to receive marketing brochures, would like to discuss any particular application or feature in more detail, or would like to learn about Tymshare's hardware offerings, please contact one of the people listed below.

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INTRODUCTION

This document is about AUGMENT, Tymshare's integrated office information system. It provides a brief view of AUGMENT's primary application areas and the system features available to support those applications. AUGMENT is a very large system of interactive computer aids. It is designed as a basic workshop in which the core knowledge work carried on by the individuals of an organization can be performed. Its design also includes features that will capitalize upon cooperative working connections with the many specialized computer tools and will comprise the "augmented knowledge workshop" of the future. These specialized functions include data base management, decision support, accounting, computer aided design, etc. AUGMENT is directly applicable to that set of user needs and technology currently known as office automation.

AUGMENT has evolved through a purposeful succession of stages during the past 20 years. It has a rich set of capabilities for handling structured text, and over the past several years has gained a basic capability for handling graphic constructs integrated into the associated text. Other forms of data, such as raw numeric, digitized voice, and eventually coded photographic, are expected to be integrated in the years ahead.

A very flexible AUGMENT file structure underlies a collection of user subsystems that are provided as basic tools. A special Command Language Interpreter serves as a common interface for all AUGMENT subsystems. A powerful and flexible Command Meta Language was specially developed to make it easy to create or modify the command language for a subsystem.

The next section describes the basic areas of application that AUGMENT currently supports within its user community. These are general application areas whose activities are found in the knowledge work of essentially every organization. It is assumed that our clients will give serious consideration to exploring the value of augmenting these activities.

Following the application areas, a number of the specific subsystems now available within AUGMENT are described.

AUGMENT APPLICATION AREAS

This section discusses the more common application areas, based on existing software. While application development can result in unique applications for each situation or client, the applications will generally contain a combination, in varying degrees, of one or more of the following areas.

- Individual Support and Personal Information Management
- Interpersonal Communication, Electronic Mail, and Teleconferencing
- Document Production and Control
- Organizational Information Management
- Software Engineering

INDIVIDUAL SUPPORT AND PERSONAL INFORMATION MANAGEMENT

The more extensive the use of AUGMENT in a participant's information activities, the greater the increase in individual effectiveness. Individual usage includes the creation, condensing, filtering, reorganization, and storage of a person's working information. This application is analogous to a computer based extension of memory.

The applications described in the following sections introduce many facilities and methods that are applicable to the management of an individual's day-to-day personal information. Their value is particularly dependent upon the level of usage. When access to a user's AUGMENT information space is made regularly, preferably daily, he or she can use reminders, agendas, calendars, notes, things-to-do lists, and so on, structured as he or

she prefers. When these are coordinated with message transactions, a great deal of the individual's business may be aided by use of AUGMENT. Other personal services can include address and phone number lists, reference lists, and financial records. AUGMENT is capable of supporting many diverse uses of this kind of intensive augmentation.

The work flow begins with the individual at a terminal during the process of generating and composing his or her ideas. AUGMENT may be used from either a teleprinter-type terminal or from the much more powerful AUGMENT 1250 display work stations at higher line speeds. In this on-line composition mode, raw ideas are entered into selected places in the information structure. These places are defined by the computer maintained hierarchical structure and selected by pointing (in display mode) to a node in that structure. Each node in the structure is a variable-length text field (up to 2000 characters) that may contain either expository or cryptic information, e.g., headings or paragraphs, or any other text the user wishes to record. The hierarchy typically serves to represent the standard dimensions of information relationships: level of detail, importance, quantity, and quality.

The hierarchically structured information may also have a superposed network interconnecting the locations of the "idea nodes", regardless of their hierarchical position. The network of connecting links is established by text in one node that names the connected-to node. The text of the link is a specially formatted citation, delimited by parentheses, such as: (norton, budget, costs). When viewing the text contained in the citing node, a user may access the cited node by simply typing the appropriate command and pointing to the link. When the information

at the linked-to node is presented, the hierarchical context displayed may contain additional links, and so on, representing an arbitrary network of information. This network can also include other users' information (following a set of privacy conventions).

Idea composition typically evolves into forms intended for others, such as letters, reports, papers, publications, manuals, communications, and think pieces, through the insertion of ideas, text, and data into a growing hierarchy that can then be expanded into paragraphs, headings, tables, diagrams, and so forth. An author may be developing several work areas in different files, with synergy added from other users' parallel information activities.

Computer support for the composition, study, and modification of the hierarchical and network relationships enable these structures to be exploited to a much fuller extent.

INTERPERSONAL COMMUNICATION, ELECTRONIC MAIL, AND TELECONFERENCING

The terms synchronous and asynchronous are currently used to describe two kinds of teleconferencing, both of which are available in AUGMENT. Asynchronous teleconferencing refers to those transactions in which the participants are not involved simultaneously. In synchronous teleconferencing, individuals are interacting in real time as they would be in a face-to-face situation. Both kinds of teleconferencing support dialogue for collaboration in a distributed community.

Asynchronous Interaction

Shared Information Space

Extension of the individual support described above to groups of individuals, with an intercommunication facility added, is easily done through shared logic computers and computer networks. Files containing the

hierarchically stored information can be made available to any selected participants using AUGMENT, utilizing a number of agreed-upon options for privacy and access. These files may be interlinked to create a shared network of information with all the inherent flexibility of the individual application. Geographical distances can become transparent due to users' remote computer entry through data communication facilities (telephone and data networks, such as TYMNET and ARPANET).

The application begins with the entry of the ideas and continues with the elaboration of the idea nodes into a narrative by each member of the collaborating team. In the case of a single product by a team effort (a proposal, report, study, etc.), agreements must be made to control access to specific files. Participants will follow some protocols; for example, only one writer at a time can modify a shared file (a logical necessity). The effect of the application as each person adds to, manipulates, and studies the common information is equivalent to passing around a paper draft for comments. Differences are that such drafts are distributed very quickly and there is no retyping phase; the material can constantly reflect the latest modifications for all involved to see and use.

Collaboration on a common product extends to public sources of information that may be studied by individuals where appropriate agreements have been made. Public data bases resemble libraries, containing, for example, information about the operation of AUGMENT or containing on-line publications.

Expanded, shared spaces require some retrieval support, which can take many forms. For this application, the use of an on-line table of contents is the most pertinent. The table of contents for public files (or private subsets) consists of lists of titles and names of files, abstract-like descriptions, and links to desired nodes in each file. Like interlinking described above, the table of contents (a "locator") is hierarchically organized, permitting categorical relationships and viewing that facilitate searching the locator.

Once any information is located (with one of many searching mechanisms), it is available for direct copying and integrating into a user's newly developing text. Although plagiarism is a conceivable concern, the free availability of information to facilitate cooperation and collaborative synergism is the goal and the result to date. An authorship record is automatically maintained for each node in each file, indicating the date, time, and author of the node's creation or last change. But this is to promote coordination, not to guarantee author credit. The facility to make all information available to every participant can be employed to significant benefit within a collaborative team or community.

Fast Memos or Messages

Most timesharing or shared logic systems provide some sort of interpersonal message handling that is simple and fast. As a component of our overall AUGMENT system, this message facility becomes most useful. The application is as broad as the need of any person or persons to communicate within the system environment and can be an alternative to face-to-face or telephone interaction. Exceptional utility results from regular, extensive use of AUGMENT, and from the resulting ease of asynchronous contact. The recipient is notified that he or she has new mail whenever next connecting to the computer. The user then may view the message (including authors, title, distribution, date, and time), act upon it (with automatic distribution of responses), and optionally store it for later reference.

Quick, easy communication is the fabric of on-line communities. In the foregoing application, there is frequent need to coordinate access to shared files and to collaborate across long distances. We have had extensive experience with this application, greatly expanded through the computer networks, which permit message traffic between distributed computers.

Recorded Interchange: The AUGMENT Journal

Dialogue support, in our sense of the application, requires facilities in addition to those needed for shared information and quick messages. Dialogue implies a longitudinal series of transactions that are interrelated to varying degrees. To fully support task-oriented dialogue, a history of the dialogue must be easily accessible through retrieval mechanisms. The history should provide a chronicle of transactions and, in a group or organization, a diary, called a Journal, of the business of the participants. A substantive part of our work for the past 20 years has been the development of software and user methodology to support this application.

The application incorporates natural extensions of individual and interpersonal communication support. Having created an on-line record of thoughts and ideas, the author (or a clerk) may direct the system to distribute it to a larger group. To submit a dialogue contribution, the author identifies the completed information structure, which can range from a file of hundreds of pages to a one-sentence message.

Distribution is aided by using the AUGMENT feature that designates any individual recipient by a unique set of initials that are maintained in an identification data base with the person's address and mailing information. A predefined group of recipients may also be designated by a single name.

Besides specifying the information source and its intended distribution, the author adds a title. If comments (analogous to a preface or other notes attached to a report) are desired, the author may append a paragraph to the collection of fields. Other fields are added automatically, such as date and time. Less frequently used fields provide the computer basis for fairly complete bibliographic handling of this unit of dialogue. The author is given on-line computer guidance for easily filling out the necessary fields.

The submitted item is automatically given a number and is stored permanently in a central location. A full bibliographic citation will be entered into library-like, computer-held catalogs. Generally, a short citation is all that is delivered to the recipients. One of the elements in this citation is a link pointing to the centrally stored item, which can be studied and copied by the recipients. AUGMENT will retrieve the item at any later date if the item's number in the link is specified.

The central storage of dialogue entries (each with a permanent number) represents the recorded dialogue, including replies and links to references, and is essentially a network of interrelated submissions. AUGMENT offers central storage for the same reason that libraries do; it is too costly for every individual to maintain his or her own collection. Central storage also encourages freer submission of commentary on prior entries, since an author knows that every reader has a simple means for accessing any of the documents that he or she cites. General access to the data base is through catalogs that are arranged by author, number, and title word. Searches through the cataloged citations also may incorporate the information retrieval facilities discussed below, such as a free-text search on the citations.

Subcollections for groups or organizations can be optionally maintained. They are essentially the organizations' management information, a record of its internal and external business. Typically, proposals, executive actions, contracts, plans, etc., are interlinked in the subcollection, replacing extensive arrays of file cabinets. More importantly, the record of this dialogue is generated as part of the daily working processes within the organization and does not require extra effort for recording. The computer based dialogue record renders the geographical dispersion of the organization unimportant.

Synchronous Interaction

Shared Terminals

Real-time or synchronous modes of communication are also well supported by AUGMENT. Generally, we have experienced a greater use of the asynchronous facility as described above, but the shared-terminal synchronous facility also has an important role.

Users' displays become analogous to a shared blackboard, upon which individual, group, and public information can be located, viewed, and edited under the control of one of the connected users. The users may be located remotely from one another. Each has a copy of the displayed information, and the control of the displayed information can be passed back and forth. This feature is frequently used in conjunction with simultaneous telephone communication; the closeness of the collaboration, even when occurring on opposite sides of the country, is quite amazing.

AUGMENT has a split-screen feature that allows several views of the same or different files simultaneously. Thus, one user can visually present his or her textual ideas alongside the other user's for direct comparison or as source material.

Real-time conferences can include groups of people at distributed locations clustered around displays as the operators enter and modify the agenda, the idea scratch pad, or the developing documents. The result is immediately available for editing into other forms, on-line distribution, or printing.

Computer Based Presentations

Another application of AUGMENT teleconferencing features is the use of the display, through a number of slave monitors or a large screen projector, for presentations to large audiences. Features such as the ability to back up to any previous view and the ability to jump ahead to predefined views (analogous to viewgraphs) may be effectively used. Of course,

the full power of AUGMENT is also available to retrieve on-line information and modify it in response to the immediate situation.

DOCUMENT PRODUCTION AND CONTROL

The mastery of AUGMENT tools and techniques outlined in the above two sections leads many organizations to consider integrating more extensive document production into their on-line workshop. AUGMENT contains a number of features that allow this to easily happen.

AUGMENT has been interfaced with a number of source-data collection devices; various word processors, local data storage devices, and established computer systems can be accessed to assimilate an existing data base of documents. The viewing features of AUGMENT are then used to quickly reorganize raw text files into structured AUGMENT files.

The shared terminal feature can be used to coordinate drafts of documents at remote locations. The shared information features can be used to insert author comments directly into the file, which can later be viewed or printed with or without the comments. The Journal is frequently used to capture versions of a document as it goes through various phases of the production and approval cycle. As a document grows to several hundred or even thousand pages, major sections can be worked on separately, yet viewed or printed as though they were a single document.

Special subsystems have been constructed to support heavier document production. There is a subsystem for comparing one version of a file to another; another for checking the spelling; another for creating and manipulating line drawings; another for checking the reading grade level, performing word counts, or automatically generating an index or table of contents; another for developing complex tables in which both the alignment of the columns and their numeric values are of concern; another for

automatically inserting special formatting instructions that control the format of the output; and yet another for verifying the final photocomposition format before a document goes to press. All of this could be too much to learn, except that the style of user interface is consistent with the basic editing subsystem, making it easy for an organization to expand its use into complex document production with minimal training.

AUGMENT has been interfaced with a number of Computer Output to Microform (COM) and photocomposition devices. One can produce various-sized microfilm/fiche, 35 mm. slides, and camera-ready copy directly from AUGMENT files. Output devices such as the COMp-80/1, COMp-80/2, and VideoComp 500 are currently supported, as well as Universal Page Format. Tymshare has arrangements with several photocomposition vendors, allowing us to offer the widest possible array of type fonts, sizes, and density; alternately, we can produce driver tapes to run on your machine. The interface to photocomposition machines is modular, so it is relatively straightforward to interface to other machines when necessary.

ORGANIZATIONAL INFORMATION MANAGEMENT

An important service is provided to an on-line organization by the interpersonal communication and documentation facilities; however, there are also needs for more structured approaches to facilitate control over the content, accuracy, and timeliness of data pertinent to the management of an organization's resources – traditionally referred to as Management Information Systems (MIS) or more generically as Information Resource Management (IRM). AUGMENT supports IRM development, evolution, and application at several levels, which are discussed in their order of sophistication below.

The first step is primarily procedural in nature, involving a modest extension of the basic applications discussed above. A knowledgeable

AUGMENT user is assigned the role of Data Base Administrator (DBA). Limited access files are established that contain information on inventory, budgets, personnel, time expenditures, etc. Records are entered and updated using the same text editing and table handling tools applicable to personal information management. More complex content patterns may be written to copy selected views of the data base and to provide special portrayals tailored to management's needs. This level of IRM application is generally limited to a single organizational unit, where that unit has complete control over the design, implementation, and maintenance of the application and where the interface to the data base is generally through the DBA.

The next level of IRM application usually involves several levels of organizational units, reporting in a pyramid to a common manager. More complex hierarchical data bases are now required to model the organization. Portions of the data base are typically maintained by several DBAs at the lower levels in the organization. Fast retrievals are made possible by assigning names to nodes in the hierarchy. Complex searches are made by using the relative location in the hierarchy and advanced content patterns as retrieval criteria - across as many files as necessary. As standard searches and reports emerge, the sequence of commands necessary to produce these reports may be placed in a file and assigned a name. This name can be made part of the AUGMENT command vocabulary, and it enables the manager to directly access the data bases via a single command. These named sequences of commands may also be submitted to the Batch subsystem and run at designated time intervals during non-prime time.

As the sophistication of applications increases, it may be necessary to create a separate IRM subsystem within AUGMENT for reasons of ease of use, tighter data control, and operational efficiency. These subsystems may be quickly written using the powerful software development environment described below. At this stage, it is desirable to provide the DBAs

with a separate data entry subsystem that controls access to the data base, provides data validation on input, and maintains transaction records for historical purposes. Managers are provided with a subsystem to search, sort, compute, analyze, and portray retrieved segments of the data bases. Additional commands are typically provided to allow temporary modifications of the data base so that "What if ...?" questions may be posed. Such subsystems are often jointly written by the client and Tymshare.

AUGMENT is designed to support fast, flexible manipulation of small to medium amounts of information. It is expected that when users need to work with very large data bases, they will have access to Data Base Management Systems (DBMS) specially designed for developing, maintaining, storing, and retrieving large data bases. AUGMENT has internal provisions for reaching through to other systems in a user-transparent manner, even if those systems are running on another machine, are running under a different operating system, and/or are programmed in a different language. This reach-through capability is employed in two ways. AUGMENT can serve as a "home workplace" for preparing data or queries for submission to a DBMS, for bringing collections of "hits" back into an environment where flexible study and manipulation is a constantly used skill, and for integrating resulting data into plans, reports, dialogue, etc. AUGMENT may also be used to provide input and an interface to special applications software (e.g., simulation, business graphics, CPM/PERT, and financial modeling packages) that do not exist in the AUGMENT environment. In both cases, the user is presented with a consistent user interface, significantly extending his repertoire of capabilities without having to learn a new language.

AUGMENT's existing commands and subsystems, provisions for user and programmer extension, and reach-through capabilities provide a very powerful environment, both for implementing IRM policy and procedures and for evolving specific organizational information

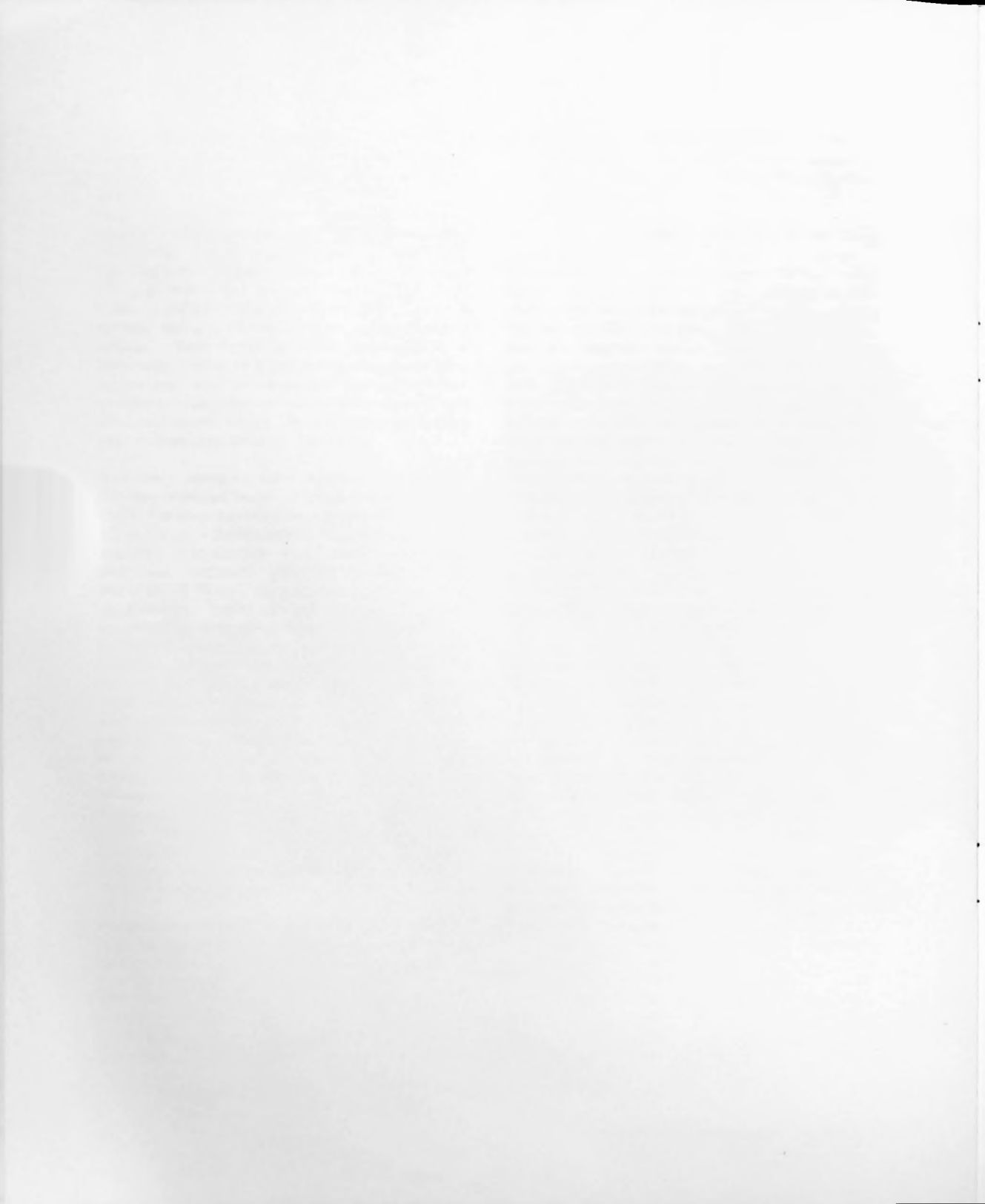
systems. With AUGMENT, it is possible to realize the elusive goal of a truly integrated data and word processing system.

SOFTWARE ENGINEERING

AUGMENT provides an exceptional environment for the development and maintenance of large software systems. This special application area -- a workshop for the software engineer -- has received special attention because of its bootstrapping impact on the long term development of AUGMENT. For a group concentrating upon developing high performance knowledge workshops, using its own tools to build its tools makes good strategic sense. Besides the types of payoff indicated for individual users and collaborative teams in the general process of working with plans, designs, documentation, schedules, etc., there is the added payoff of special subsystems we have developed for supporting the programmers' library, for compiling and loading very large programs, and especially for interactive debugging within a multi-process environment across a network of computers.

We use two higher level structured programming languages to evolve AUGMENT: Command Meta Language (CML) for specifying commands and controlling display formatting, and L10, a string manipulation language for writing executable code. Interfaces between the AUGMENT file structure and other high level language compilers such as COBOL, BASIC, and JOVIAL have been developed to meet clients' special needs.

For client organizations that do extensive software engineering, we recommend that they seriously consider the payoff they will realize from the "augmented knowledge workshop" approach.



STANDARD FEATURES TO SUPPORT APPLICATIONS

This section presents the standard subsystems currently available to AUGMENT users. These subsystems are provided as basic components because of their general usefulness. Tymshare also generates subsystems in association with the application development work of specific client organizations. Except in the area of software engineering, Tymshare defers the evolution of specialized subsystems until potential applications are identified for a client.

LIST OF STANDARD FEATURES

Base	Mail	Spell
Calculator	Matcher	Table
Calendar	Modify	Telecopy
Compose	Programs	Universal
Conference	Publish	Help
Encrypt	Read	Profile
Format	Retrieve	Batch
Graphics	Command Sequences	
Include	Wide and Long Screen	

BASE: reading, writing, modifying, filing, and printing

The user is in the Base subsystem when he or she enters AUGMENT. Base is the home subsystem in AUGMENT. It has commands that permit the user to read, write, and modify on-line information and to print it, among other things.

Reading and Viewing Information

A user may read any AUGMENT file whose name he or she knows, except a file for which access has been specifically restricted. After having specified a file, a user may move around within its structure by pointing to a specific place. A user may view a file at his or her terminal in different ways with view specifications, or may print a file for off-line reading. The ability to move through and between files while optionally changing the view specifications is available in all subsystems.

For example, a user may limit the view to any given level of depth in the hierarchical structure, limit the number of lines of each node displayed, set up content analysis filters, request certain display formatting features (e.g., double spacing between paragraphs) or request information about each node (e.g., by whom and when it was last edited).

A user may follow pointers (links) to other views (even to views of other files). A user may scan for content or for a specified node. A user may also list or retrace previous views of a file and the previous succession of files.

Writing, Creating, and Modifying Information

A user may create new files, copy all or selected parts of existing files into other files, insert text by typing into existing files, and edit existing text. The Base subsystem holds all the most frequently used commands where privacy restrictions permit, allowing the user to manipulate the contents of files and the files as a whole.

Modifying Text

A user has available a large set of commands that allow him or her to freely modify the information. A user can work at the structural or content level and delete, add, move, replace, sort, or transpose anything he or she sees on the terminal. The mouse-controlled cursor is particularly effective for pointing at display information.

Manipulating Files

Entire files may be created, moved, renamed, or deleted. They may be made private or open (to everyone or to a specific list of individuals and groups).

Publishing

AUGMENT provides the basis for flexible systems of creating, modifying, disseminating, and controlling documentation. By placing special formatting instructions, called directives, in a file, one may format the file for output on a wide variety of hardcopy devices, including a printing terminal, a high-quality printer, a high-speed line printer, or photocomposition devices. Photocomposition devices offer publication-quality output suitable for photo-offset printing, giving the user control over type font, columnation, and full justification as well as the standard parameters of page layout and special text generation (e.g., numbering) available on all output devices.

CALCULATOR: performing arithmetic calculations directly from text

The equivalent of a desk top calculator (with ten registers) is available as a subsystem. Its power lies in its ability to interface directly to files, reaching in for data and placing the result in the file as commanded. This subsystem plays an important role where simple numeric analyses support a document (e.g., proposals, budgets, or financial analyses).

CALENDAR: organizing individual and group calendars

The Calendar subsystem permits a user to schedule daily, monthly, pending, or recurring meetings with others. Entries are made in all calendars involved and may be viewed by each user to manage his or her time. Conventions for agreement on proposed meeting topics, dates, etc., and on meeting cancellation or rescheduling are made between users as they wish. This subsystem facilitates the process of scheduling such meetings by communicating requests and pertinent information such as meeting topics, dates, times, duration, requesters, participants, and comments to all concerned.

COMPOSE: producing files for publication-quality devices

The Compose subsystem contains tools to produce typeset files from standard AUGMENT files. Output devices for these files include Computer Output to Microform recorders, such as the COMP-80/2, the VideoComp 500, and others. The page layout, type size, type style, inclusion of color, and positioning of line drawings are controlled by format directives. Preliminary visual proofing of page layout, including the position of drawings, columns, and line breaks can be done on a high resolution graphics screen with or without an attached printer. A text file describing the exact type size, type style and line lengths can also be produced for more detailed proofing. Once the user is satisfied with the appearance of the document, he or she can prepare the file for output to the intended device. The design of Compose is modular, allowing for adaptation to new output devices as they become available.

CONFERENCE: multi-party simultaneous file review and collaboration

The Conference subsystem permits a user to call an on-line conference of two or more people, view and edit files, add and remove conferees,

pass the gavel, and transparently connect to other AUGMENT machines via TYMNET or ARPANET. Conference is often used with a voice connection to support document review and revision in a synchronous mode, where all conferees can see and discuss changes as they are made.

ENCRYPT: encrypting selected files

The Encrypt subsystem permits a user to encode any of his or her files with individual passwords of his or her choosing. These files may only be read by others who have access at the operating system and AUGMENT directory and file privacy levels, and who also have the password to the encrypted file.

FORMAT: automatic formatting using format directives

The Format subsystem formats an AUGMENT file according to a planned design. The automatically inserted directives will result in one of several formats that can be printed on a printer or published through photocomposition.

GRAPHICS: creating and modifying diagrams and illustrations

The graphics capability of AUGMENT enables users to write, display, and output diagrams containing line drawings and text labels. Diagrams may also be printed through a photocomposition device, combined with the text of the AUGMENT files. Both diagrams and text are stored in the same AUGMENT file. It is necessary to use AUGMENT with special graphics equipment to display and produce diagrams. The graphics work station consists of the alphanumeric display terminal (AUGMENT 1250), and a Genisco G-1000 or Tektronix 4014 compatible display with an optional graphics printer.

INCLUDE: working with portions of several documents as if combined

The Include feature presents portions of different files (and portions of the same file) as if they are combined in sequence for purposes of viewing and editing. This feature is particularly useful when working with very large documents, such as sections of a set of manuals or chapters of a very large document.

MAIL: composing, distributing, reading, and managing mail items

The Mail subsystem makes it possible for an organization to substantially replace internal paper mail with electronic mail. Mail enables a user to compose, distribute, read, and manage items ranging from a one-line message to a 400-page report. Mail supports multiple drafts of messages, distribution lists, message templates, certified mail, 1st/2nd/3rd class delivery, and sequential or broadcast delivery to individuals' private mailboxes, to public bulletin boards, or to a library (called a Journal). Public items submitted to a Journal (each client organization may have their own) are automatically cataloged and indexed. Extensive provisions for searching these catalogs or private mail files by Boolean combinations of item numbers, title words, keywords, authors, dates, etc., are available.

The Mail subsystem has the following features: easy-to-learn English commands; profile settings to tailor Mail behavior to each individual; a built-in editor; unlimited user-defined filing categories; the ability to comment, edit, pass, and track the progress of an item; privacy and access controls; and user control over the delivery class, timing, and destination of an item. These features are backed by automatic mail forwarders, interfaces to Department of Defense and public packet-switched networks, user directory search capability, and compatibility with domestic and international electronic mail standards.

MATCHER: comparing two documents, designating changes

The Matcher subsystem enables a user to compare two version of a document (two files) to see what portions have been deleted, moved, added, or changed. The user can determine the dates and times of changes and the identification of the user who made the changes.

MODIFY: special purpose editing commands

There are several commands in the Modify subsystem that enable the user to edit across large information structures. For example, the user can delete a column in several headings or lines, combine many paragraphs into a single paragraph, change the case of sentences to standard sentence case (first letter upper case), add text to the beginning or end of many paragraphs or headings, and so on.

PROGRAMS: loading and compiling programs and subsystems

The Programs subsystem contains commands that support programming activities. Users may write programs or subsystems in Base, and then use the Programs subsystem to compile and load them. The Programs subsystem also contains commands to insert program templates, which help users write programs.

Non-programming users may use two of the Programs commands to get information about loaded programs and subsystems and to control what special programs and subsystems are loaded for their AUGMENT session.

PUBLISH: generating special sections of documents

The Publish subsystem aids the user in document production. The subsystem is used to automatically generate a table of contents or references in standard formats. The subsystem can also count words.

READ: calculating reading grade levels and other characteristics

The Read subsystem provides a user with the reading grade level and other information for any portion of a document or for the whole document. It provides data on the number of letters, words, vowels, consonants, syllables, and sentences in a document. It is particularly helpful for balancing the readability of a document across its various sections, while providing an overall readability deemed to be appropriate for the selected readers.

RETRIEVE: finding and working with specially retrieved information

The Retrieve subsystem allows experienced AUGMENT users to easily gather statements based on content and structure. No special terminology or theoretical framework beyond AUGMENT editing is necessary for successful interaction. It is not styled toward any particular retrieval problem or data base. The user may conditionally copy, move, or delete AUGMENT structures, or just print or display them. The user specifies the conditions by means of content patterns and structural relationships.

SPELL: interactive or batch checking and correction of spelling

Using Spell, a user can check text files for spelling errors. When the subsystem finds a word it does not recognize, the user can either correct the word or accept the word as it is. Whenever possible, Spell will suggest one or more correctly spelled guesses that the user may choose to utilize. The system keeps track of the words that have been corrected, and subsequent occurrences of identical errors will be automatically corrected. When a file contains correctly spelled words that do not appear in the system dictionary (containing about 45,000 words), the user has the option of inserting them into a special dictionary that will be used to check the rest of the file. Such

dictionaries may be used in subsequent sessions in combination with the system dictionary, thus allowing users to maintain dictionaries containing their own special words.

TABLE: creating and working with information in table formats

The Table subsystem provides very useful capabilities to users working with tables of letters and numbers. Tables may be easily defined, and entries may be entered, manipulated, sorted, calculated, and totalled in ways that save a great deal of time. Tables may be nested so that the composite elements of any given total line in a table may be stored under that line and viewed or printed at the user's option. By using the Command Sequences feature described below, users can have tables automatically totalled at all levels in a hierarchy, thus permitting changes to be made at lower levels, with the resulting changes being automatically made at all levels in the hierarchy.

TELECOPY: moving files between AUGMENT hosts

The Telecopy subsystem can be used to copy files from one AUGMENT host to another, with options for specifying TYMNET or ARPANET as appropriate to the user. Telecopy allows the user to retain his or her context in AUGMENT without having to leave and use similar facilities available at the operating system level.

UNIVERSAL COMMANDS: getting help, jumping, calling subsystems, changing profiles

Universal commands are available in all subsystems. They allow the user to move among subsystems, move within and among files, change the style of interaction, and get help information about using AUGMENT without leaving the context of the particular subsystem they have currently selected for use.

HELP: getting complete on-line information about AUGMENT

Help is a universal command that provides users with the most detailed and up-to-date information available on AUGMENT. Help provides the definition of any AUGMENT command or term, descriptions of AUGMENT procedures, and advice on how to accomplish a particular type of task. Users may utilize Help to obtain specific information or to browse through general subjects to explore AUGMENT.

Users can specify the Help command at any time to receive information about any aspect of AUGMENT. A user can also get specific information about a command he or she is in the process of giving by typing the HELP key. Once a user has entered Help, he or she may repeatedly ask for further information.

PROFILE: adjusting interaction with AUGMENT

The AUGMENT user interface can be altered to fit a user's own equipment, use patterns, and style by using the universal Set Profile command in the above subsystems. The effects of Set Profile commands hold for future AUGMENT sessions, until the commands are used again to specifically change them.

COMMAND SEQUENCES: extending the command set

AUGMENT provides users with the ability to enter AUGMENT command sequences as text, give them a name, define them, and save them; they may be executed at a later time by simply invoking their name. Command sequences may be constructed from any of the legal commands in any subsystem, and have looping, testing, and conditional branching capabilities. Command sequences allow the user to expand and personalize the command set without resorting to programming.

BATCH: scheduling operations under batch control

Users may enter batch requests to the operating system by using the Batch system accessed from the operating system level. Batch system requests may specify the dates and times for AUGMENT operations to be performed. Thus, it is possible for routine operations to be performed without user intervention as frequently as needed.

WIDE AND LONG SCREEN MODES:
viewing wider or longer formats

The wide screen and long screen features increase the effective display area of the AUGMENT 1250 terminal. A wide screen is especially useful for quickly viewing files with lines longer than 80 characters, such as tables containing between 81 and 160 characters on a single line. A wide screen allows the user to view the wide-format text as it will appear when printed on a wide-carriage teleprinter or line printer. A long screen is useful anytime a user wants to view formats requiring more than 24 lines of text. A wide or long screen is viewed by scrolling the screen horizontally or vertically to view any 24-line by 80-character area of the image. With a wide or long screen, two screen areas of text are stored in the terminal rather than just one. Wide and long screens are enabled by giving local terminal commands, and can be used simultaneously. As an additional aid, the AUGMENT 1250 terminal enables users to save screen views for quick reference later in a session.